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SPACE CENTER Roundup

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STS-95 features full slate of activities

By Kelly Humphries

At the end of this month, the first American to orbit the Earth once again will experience what it's like to be in space. But instead of being the bold explorer he was 36 years ago, he will be among the developers, the users, the exploiters of space.

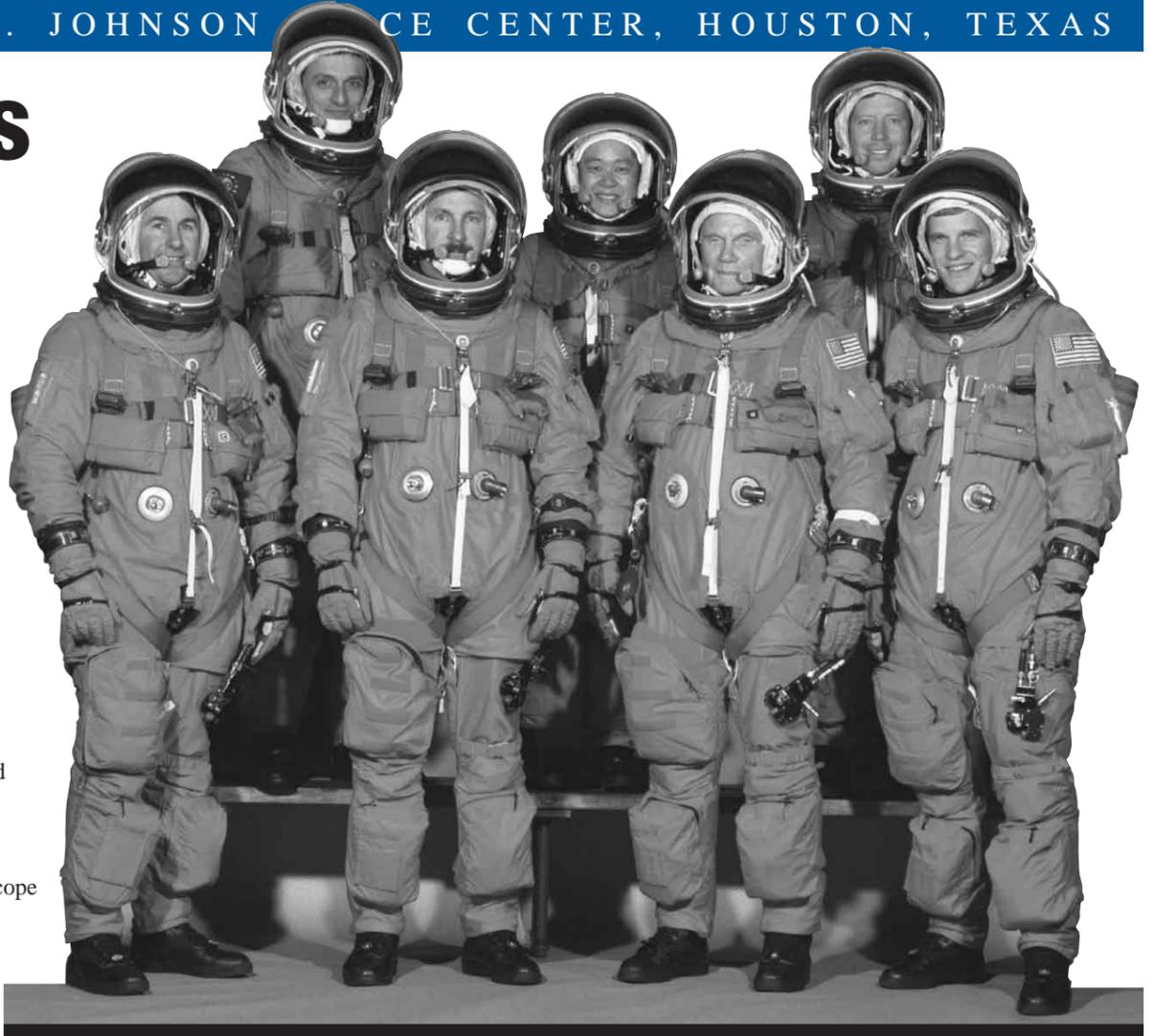
John Glenn will be leaving *terra firma* not as a lone pioneer with the hopes and Cold War fears of a generation riding on his shoulders, but as a member of a research team delving into the secrets of the universe and humanity's ability to tame them for its purposes.

Glenn will join STS-95 Commander Curt Brown, Pilot Steve Lindsey, Mission Specialists Scott Parazynski, Steve Robinson and Pedro Duque, and fellow Payload Specialist Chiaki Mukai on a mission to deploy and retrieve a satellite that will study the Sun's corona and the solar wind, deploy a small Navy amateur radio satellite, test hardware to be used on the third Hubble Space Telescope servicing mission, conduct ultraviolet astronomy observations and work with a variety of in-cabin microgravity research projects.

During the nine-day mission, the astronauts also will support a series of investigations designed to better understand the correlation between the aging process on Earth and the physiological effects of space flight on the human body.

In short, STS-95 will stretch the capabilities of both the crew as researchers and the shuttle as a research platform. And it will do so with the whole world watching an American hero return

Please see **STS-95**, page 2



JSC Photo S98-13388 by Mark Sowa

The STS-95 crew will have a full slate of activities to perform during *Discovery's* upcoming mission, including testing hardware to be used on the next Hubble Space Telescope servicing mission. Re-creating a famous Original 7 pose are (left to right, front): Steve Robinson, Curt Brown, John Glenn and Scott Parazynski; (left to right, back): Pedro Duque, Chiaki Mukai and Steve Lindsey.



NASA Photo

International Space Station Astronauts Carl Walz (left) and Jim Voss learn the operations of the Russian Soyuz spacecraft in a simulator at the Gagarin Cosmonaut Training Center in Star City, Russia.

Space station crews training for initial flights

International Space Station Astronauts Carl Walz and Jim Voss are among 12 astronauts and cosmonauts now training for the first flights to live aboard the International Space Station for which the Soyuz spacecraft will serve as an emergency escape vehicle or lifeboat.

Voss, along with Astronaut Susan Helms and Cosmonaut Yuri Usachev, expedition commander, is scheduled to launch aboard Space Shuttle mission STS-100 in December 1999 on the second crew planned to occupy the new station. Walz, along with Astronaut Dan Bursch and Cosmonaut Yuri Onufrienko, expedition commander, is scheduled to fly to the station aboard shuttle mission

STS-105 in June 2000 as the fourth crew to live on the ISS.

The space station crew members alternate training at JSC and in Star City as they prepare for their missions. The first crew for the station, Astronaut Bill Shepherd, expedition commander, and Cosmonauts Yuri Gidzenko and Sergei Krikalev, is planned to launch in July 1999. The first crew will spend five months aboard the space station.

The third crew for the station, Astronaut Kenneth Bowersox, expedition commander, and Cosmonauts Vladimir Dezhurov and Mikhail Turin, is scheduled to launch in March 2000. ■



Open House attracts record turnout.

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A new hit: swinging at the Gilruth.

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JSC Language Education Center opens.

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NASA awards consolidation contract to Lockheed Martin

In another major step to save money and improve efficiency, NASA selected Lockheed Martin Space Operations Co., of Houston, to manage the agency's human and unmanned spacecraft ground operations under a 10-year contract worth a potential \$3.44 billion.

Lockheed Martin will be responsible for work previously performed under 17 different contracts at five NASA facilities, including JSC.

The award was the largest by NASA since its 1996 selection of United Space Alliance, a joint venture of Lockheed Martin and The Boeing Co., for a \$12 billion, 10-year contract to run day-to-day management of space shuttle operations. Boeing was Lockheed Martin's lone rival

for the Consolidated Space Operations Contract awarded in September.

The Consolidated Space Operations contractor will manage all of NASA's data collection, telemetry and communication operations supporting its Earth-orbiting satellites, planetary exploration and human space flight activities. The contract shifts management responsibility from five NASA centers to a single entity, which is an unprecedented step for an operation of this magnitude. This effort is being closely observed by other government agencies that also are reviewing consolidating their operations.

The basic contract amounts to \$1.90 billion for a duration of five years,

including a three-month phase-in period. The contract runs from October 1998 to December 2003. The award also contains options totaling \$1.54 billion, which includes a five-year extension of the basic effort (January 2004 through December 2008); additional options for work at the Kennedy Space Center; and enhanced mission and data service support to the International Space Station program.

Under the contract guidelines, NASA will adopt a plan that calls for implementing private sector commercial practices, products, services and technology. NASA expects the contractor to reduce overlap, eliminate duplication and increase efficiency by streamlining service delivery processes. NASA also

expects Lockheed Martin to "commercialize" or "privatize" government systems where the offset will lower the life-cycle cost of space flight missions.

The range of the contract's services will include data acquisition from a spacecraft, data transmission to the end user, data processing and storage, ground and space communications, and mission control center operations.

The work will be performed at five NASA locations including JSC, Goddard Space Flight Center, Marshall Space Flight Center, Kennedy Space Center and the contractor-operated Jet Propulsion Laboratory. The work will be managed by the Space Operations Management Office at JSC. ■

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STS-95 to demonstrate capabilities of crew, orbiter

to orbit and the space program make the transition into the International Space Station era.

"I look at this mission as a showcase," said Flight Manager Michelle Brekke of the Shuttle Program Office. "Not only of a special crew, but of the capabilities of the orbiter. We're basically exercising every aspect the orbiter has to offer to support research and payload operations."

In all, there are more than 80 payloads and experiments on the flight, many of them with conflicting requirements. The Hubble Space Telescope Orbital Systems Test will require an altitude of 345 miles, which stretches the envelope of shuttle performance. Deploying and retrieving the Spartan 201 solar observation satellite and pointing the International Extreme Ultraviolet Hitchhiker instruments will place high demands on the attitude control propellants. And the microgravity materials experiments will call for a minimum of disturbances, which is tough to achieve between and around the maneuvers needed by the other payloads. The shuttle's robot arm will be used to deploy the two satellites and help test three special vision systems that will be invaluable in helping put together the pieces of the space station.

"This flight had a full complement of things to do and an identity before John Glenn ever got assigned to it," said Lead Flight Director

Phil Engelauf. "It is probably the fullest mission that I can remember working. We are running at our limits on crew time, on propellant capability and electrical power capability."

Discovery is scheduled to launch at 1 p.m. CST October 29 amid some of the most extensive news coverage in space program history.

"I wish all flights were covered like this because the American people, the people of the world, need to understand what we're doing in the space program," Brown said. "This one is special because we have Senator Glenn on board. We're thrilled to have that coverage. We're thrilled to have him on board."

Lindsey said Glenn's second trip into orbit foreshadows a future where just about any healthy human will be able to fly in space.

"I know that sometime in the future we will fly in space like we fly on commercial airliners today," Lindsey said. "I don't know when that is – a lot of technology hurdles will have to be overcome before we can make it affordable – but that will happen. In a way, he's not only a tie to the past but flying with him is a tie to the future because he's representative of the fact that someday we will be flying everybody into space."

Robinson, who will be joining Glenn on the middeck for launch, said he expects a personal thrill before he gets down to the business of the flight.

"On his first launch, when Glenn got into orbit, the engines cut off and he was in the weightlessness of a microgravity environment, there was nobody there to welcome him to space," Robinson said.

"Well, this time I'll get to do that, and I think that'll be an honor."

The crew and the STS-95 training team, working closely with the Mission Control team – especially Flight Activities Officers Roger Smith and Terry Schneider, Propellant Officers Lonnie Schmidt and Cathy Larson and Rendezvous Officer Dave Harshman – have spent many hours working out

the best way to juggle the conflicting schedule and performance requirements of the various STS-95 objectives.

"There are over eighty payloads on the flight, the majority of which involve considerable crew intervention," Parazynski said, "so it's a very exciting and challenging mission and it's very fortunate that we have such an experienced crew to tackle all these very exciting payloads."

"We're going to try to help each other to make sure that everything gets done exactly right and nobody misses one of these important steps on the procedures to conduct the science or the operations," said European Space Agency astronaut Duque, the first Spaniard to fly in space.



JSC Photo S98-08741 by Joe McNally, National Geographic, for NASA

Three crew members in training for the STS-95 mission check out a training version of a blood centrifuge that will accompany them aboard *Discovery* later this month. In the foreground (from the left) are Scott Parazynski and Pedro Duque, mission specialists, and U.S. Sen. John Glenn Jr., payload specialist. Duque, representing the European Space Agency, has his right hand on the centrifuge. Sen. Glenn holds a vial of blood that would be placed inside the centrifuge. Among those in the background is Astronaut Stephen Robinson (left side of frame), STS-95 mission specialist.

The mission's prime objective, deployment and retrieval of the Spartan 201 satellite, will reprise activities attempted unsuccessfully on STS-87 when the satellite had to be manually retrieved during a space walk. Procedures and software have been revised, but the crew will be taking special care to ensure the satellite is freed to make its important observations.

"On STS-87, when we released the robot arm from the satellite, the satellite did not do that pirouette maneuver, and so it was a dead satellite sitting there," Lindsey said. "When we finally get to the step where we're ready to pull it out and we're ready to deploy it, we will have something on the screen that tells us, 'Yes, this satellite is go for deploy. All the actions that need to be done have been done to make this thing go.'"

Since aging and space flight share a number of similar physiological responses, the study of space flight may provide a model to help scientists interested in understanding aging. Some of these similarities include bone and muscle loss, balance disorders, and sleep disturbances and those will be the focus of Glenn's work.

Glenn's age will be a key variable that researchers keep in mind as they collect important, initial observational information on the interaction of space flight and aging. This is a new area of interest and research just beginning with STS-95. Scientists will be using pre- and post-flight samples and on-orbit measurements to look at areas where the effects of aging and space flight appear

to be parallel, specifically bone and muscle density, balance, blood pressure, sleep and immune systems. When astronauts go into space they have these changes, but they reverse once they readapt to Earth.

"What you're trying to find out is, 'What within the human body turns these systems on and off?'" the 77-year-old Glenn said. "If we can learn some things like that, we not only can do a lot to take away some of the frailties of old age with osteoporosis and immune system changes, muscle degradation, things like that, but also help the astronauts up there now that have these things affect them in space."

Glenn, who will be the oldest human to fly in space, said researchers at the National Institute on Aging will seek to determine if his age is a factor in his body's adaptation to microgravity.

"Would I be immune then, basically, from those changes that the younger astronauts experience? If that would occur, why? Would it affect me more? If so, why? When you come back to Earth, what's the rate of recovery? If there's a different rate of recovery between someone my age and the younger astronauts, why does that occur?" Glenn said.

Most of the simulations are behind the flight control team and crew, which have learned a lot that has been incorporated into the procedures and mission plans, Engelauf said. "Now we have only the last few sims and the flight readiness review is coming up in a couple of weeks. I think we're in pretty good shape here about four weeks before launch." ■

'This flight had a full complement of things to do and an identity before John Glenn ever got assigned to it. It is probably the fullest mission that I can remember working. We are running at our limits on crew time, on propellant capability and electrical power capability.'

– Phil Engelauf, lead flight director

C O M M U N I T Y N E W S

120,000 attend Open House

Event provides fun, education

As balloons drifted across the sky, the sun rising on the horizon, volunteers prepared JSC for its fourth annual Open House. By the time the last balloon had landed, the first of a record-setting 120,000 visitors streamed into the center.

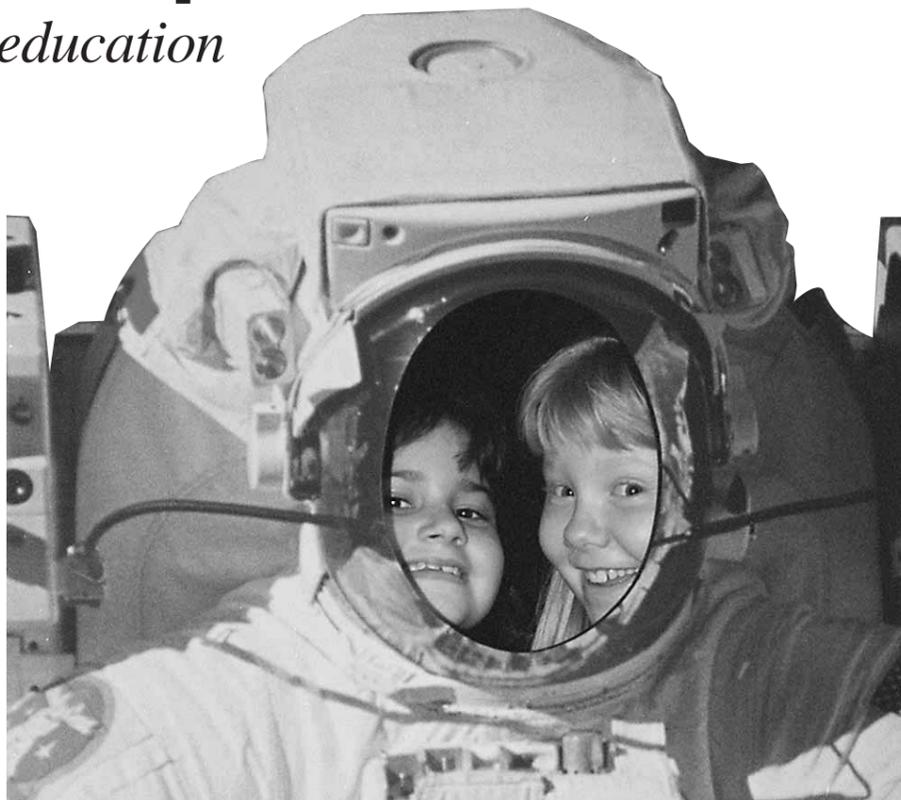
With a theme of "Johnson Space Center: Houston, Texas: Space City USA," JSC opened its doors to the public for a behind-the-scenes look at the center. The event was held in conjunction with the sixth annual Ballunar Liftoff Festival.

Twenty buildings and facilities featuring more than 150 exhibits and displays were open to help visitors experience human space flight and associated technology. NASA employees were on hand to explain their duties, describe how equipment functions and answer space-related questions.

Nearly every facet of space flight was featured in the array of displays and demonstrations. Mission operations, shuttle and space station training and simulations, robotics and virtual reality, manufacturing and fabrication, spacecraft propulsion and energy systems, space communications, life support and space suits, and a wealth of scientific investigations were included.

Visitors were able to tour the historic Apollo Mission Control Room and view the new Mission Control Center. Guests were able to fly the shuttle from final approach to touchdown using a laptop landing simulator and try out tools astronauts use in space.

"The space program itself seems to have improved my life," wrote a visitor from Texas on comment cards. "I plan to make NASA my life, so this Open House is like a dream come true."



JSC Photo S98-12116 by Steve Candler

Children peer out of a space suit on display during JSC's fourth annual Open House.

"I love coming every year," wrote another visitor from Texas. "We, as a family, enjoy coming to see the modern technology."

A new feature this year was the exhibit in Bldg. 29, open for the first time. Here visitors could view the life support chambers that are being equipped for ground-based testing of future life support systems and learn about concepts for growing plants in space.

Visitors to the medical and life sciences laboratory in Bldg. 37 learned how experiments conducted in space may

lead to new treatments for cancer, AIDS and osteoporosis. Here guests caught a glimpse of the bioreactor, used to grow 3-D human tissue in a zero-g environment.

Mars and the Moon were featured in Bldg. 31 where visitors were able to catch a close-up look at a lunar sample, a meteorite from Mars and cosmic dust. Children were able to sample "edible rocks" and explore simulated Mars sandboxes.

Teague Auditorium offered presentations on the shuttle-Mir program, the effects of weightlessness on the

nervous system and the future of human space exploration. Guests were able to view photos and a video taken aboard a shuttle flight.

Visitors were able to bring a little piece of the space program home because some demonstrations yielded souvenirs such as shuttle models and IMAX camera miniatures etched with a laser.

Other activities available outside the center's gates included tours of the Sonny Carter Training Facility, home of the 6.2-million-gallon tank used to perfect spacewalking techniques, and Ellington Field, the base for NASA's aircraft fleet including the KC-135A. This year buses were available to take guests out to these two facilities, and visitors were able to view the Super Guppy aircraft. As a result, attendance at these venues doubled over last year, increasing to 4,000 visitors.

Approximately 200 internal and center-wide volunteers made the event successful. The internal volunteers, from almost all areas of JSC, staffed the exhibits. The center-wide volunteers performed numerous duties including staffing 12 information booths, which also served as water stations to provide relief from the heat.

"What left the greatest impression on me personally were the volunteers," wrote one visitor in a letter to the Public Affairs Office. "How wonderful it must be to love your work so much and to be so dedicated to educating us, the public."

Not only does Open House provide visitors with a better understanding of the space program, but it also gives JSC a chance to strengthen its ties with the community, said Donn Sickorez, deputy for this year's Open House activities.

"Open House is an attempt by JSC to look outward to the community to provide recreation and education," he added. ■

JSC Safety Alert

Caution on Saturn Lane

What Happened

Heading north on Saturn Lane, a multiple-car pileup almost occurred as people stopped unexpectedly in both lanes. Shortly after stopping, a fire engine pulled out of the new station on Saturn and headed to an accident scene at Bay Area and Saturn. Only then did a motorist notice that the flashing yellow light had turned red at the fire station driveway. The truck had no sirens going as it pulled out into traffic, nor were there any other audible alerts.

Outcome of the Investigation

The speed limit on Saturn Lane leaving JSC (northbound) is 50 mph. There are yellow flashing traffic lights as motorists approach the entrance of the new Houston Fire Department Station 72. These lights automatically turn from flashing to solid yellow, to red when the Fire Department responds to an emergency. Fire trucks leave the station with engine lights flashing and sound the sirens only once en route.

What You Can Do

A yellow light means caution. It is the driver's responsibility to be aware of flashing yellow lights and to anticipate that the lights could change to red at any time. Drivers should always be prepared to reduce their speed in this event.

GILRUTH CENTER NEWS

Hours: The Gilruth Center is open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday.

Gilruth badges: Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday and from 9 a.m.-2 p.m. Saturdays. Cost is \$10. Dependents must be between 16 and 23 years old.

Nutrition intervention program: Six-week program includes lectures, a private consultation with the dietitian and blood analysis to chart your progress. For details call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is \$25. Call for next available class.

Stamp club: Meets every second and fourth Monday at 7 p.m. in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. The next classes are scheduled for 8 p.m. Oct. 8 and Oct. 29. Pre-registration is required. Cost is \$5. Annual weight room use fee is \$90. The cost for additional family members is \$50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Step/bench aerobics: Low-impact cardiovascular workout. Classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks. Call Kristen Taragzewski, instructor, at x36891.

Yoga: Stretching class of low-impact exercises designed for people of all ages and abilities in a Westernized format. Meets Thursdays 5-6 p.m. Cost is \$32 for eight weeks. Call Darrell Matula, instructor, at x38520 for more information.

Ballroom dancing: Classes meet from 7-8:15 p.m. Thursdays for beginner advanced classes and from 8:15-9:30 p.m. for beginner-intermediate and intermediate students. Cost is \$60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health-related fitness program includes a medical screening examination and a 12-week individually prescribed exercise program. For more information call Larry Wier at x30301.

Gilruth Home Page: Check out all activities at the Gilruth online at: <http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm>.

TICKET WINDOW

Bldg. 3 Exchange Store hours are 7 a.m.-4 p.m. Monday-Friday.

Bldg. 11 Exchange Store hours are 9 a.m.-3 p.m. Monday-Friday.

For more information, please call x35350.

The following discount tickets are available at the Exchange Stores:

General Cinema Theaters \$ 5.50

Sony Loew's Theaters \$ 5.00

AMC Theaters \$ 4.75

Astroworld Summer Saver (on sale until Oct. 15 /

valid until Nov. 1) \$21.00

(valid at all Texas Six Flags Theme Parks)

Moody Gardens (2 of 6 events) \$ 9.75

Space Center Houston adult \$10.25 child (4-11) \$ 7.00

(JSC civil service employees free.)

Metro Tokens and value cards available.

Renaissance Festival Tickets adult \$14.00 child \$6.00

All tickets are non-refundable.

Photo processing: 3-inch single prints, \$2.99; 3-inch double or 4-inch single prints, \$3.99; 4-inch double prints, \$5.99.

Coming soon:

Halloween Kids' Party at Space Center Houston

Halloween Dance at the Gilruth Center

Renaissance Festival Bus Tour

Anastasia on Ice

Inspection 98 to showcase JSC technologies

Attendees from throughout the world will be able to explore NASA-developed technologies when JSC opens its doors to host Inspection 98 for three days, October 14-16. The third annual event brings together thousands of private industry, business, government, community and education leaders to explore firsthand the programs, activities, facilities and technologies that make human space exploration a reality.

More than 2,400 visitors from 45 states, the District of Columbia, Puerto Rico and 13 foreign countries attended Inspection 97. This year, with more than 200 exhibits and presentations scheduled, the event offers expanded opportunities for what is expected to be an even larger number of visitors.

NASA/JSC Inspection 98 will showcase the space shuttle and

International Space Station programs, Mars studies and the space-age technologies and expertise that make them possible. Technical exhibits will encompass many disciplines and topics including aeronautics and aviation, aerospace mechanisms, astronaut training, education and outreach, human factors, human life support and tools, imaging technologies, materials and manufacturing, measurement technologies and scientific instruments, medicine and healthcare, power and propulsion, robotics and virtual reality and technology transfer.

"Much of the work we do – from propulsion and avionics to telemedicine and robotics – has potential commercial applications," said Kathy Jurica, Inspection 98 chair. "Many attendees of past Inspection days have found technological applications in the life sciences and other fields that they have since put to use in their own work."

Justin Kerr, manager of the Hypervelocity Impact Technology Facility at JSC, holds up a simulated whipple shield. On exhibit during Inspection 97, this shield is used to stop orbital debris from damaging spacecraft. It consists of an aluminum bumper placed some distance in front of the outer wall of a spacecraft. The whipple shield is designed to shock approaching projectiles and break them into small fragments. An expanding debris cloud is produced that spreads the energy of impact over a much larger area, making it much less damaging.



JSC Photo S97-15213



JSC Photo S97-16529

Inspection 97 host Dean Eppler (right) and a guest discuss U.S. research planned for the International Space Station.

We envision that this year's event will not only continue but indeed accelerate this trend."

Attendees will be able to explore technologies they may be able to use in the fields of information technology, biotechnology, energy, architecture, agriculture, medicine, robotics and industrial automation, transportation and manufacturing, to name only a few. Forums will explain how to use NASA technologies to meet regional and national challenges.

To highlight major points of interest and to draw visitors to all sites across the center, JSC will be divided into three major areas or "hubs" plus two off-site facilities, the Sonny Carter Training Facility and Ellington Field, during Inspection 98. Buildings 5, 9 and 13 have been designated as hubs. Guest services available at each hub include information booths, coffee services, phone bank facilities and limited food service.

In conjunction with Inspection 98, a mission briefing by shuttle/Mir commanders and others is planned on the evening of October 14 at Space Center Houston. The event is open to the public; seating is limited. ■



JSC Photo S97-15309

Inspection 97 attendees caught a glimpse of the NASA Arc Jet Test Facility at JSC. The high temperature aerodynamic wind tunnel test is used to test materials that will be used on shuttle upgrades, advanced flight vehicles such as the X-38 and rocket and nose-cone reentry vehicles.

Employee participation key to making Inspection 98 a success

T*o ensure that Inspection 98 is successful again this year, the participation of every JSC employee is needed. Here is a list of questions that employees usually ask about this event:*

Why does JSC host Inspection days?

For three days each year, JSC displays its space flight technologies and techniques to leaders of government, industry and academia who might not otherwise interact with the aerospace community. Inspection days offer JSC the opportunity to showcase work performed to support this nation's human space flight program and to transfer space technology into commercial industries.

Why should JSC employees participate in Inspection 98?

To have a successful event, the participation of every employee is needed. JSC employees will have the opportunity to draw from the experience of individuals who work in many industries to find innovative approaches to their own challenges and to identify areas where partnerships could be mutually advantageous.

Who is the target audience?

The target audience is professionals from government, industry, academia and the community. The event is not recommended for children.

What is the proper attire for exhibitors?

Business dress is required for all exhibitors.

How do I volunteer?

Employees who would like to participate on a committee or volunteer to help their organization should contact their directorate/office point-of-contact.

Will training be provided for volunteers?

Training for new volunteers will be held from 1 p.m. to 2:15 p.m. Oct. 6 in the Teague Auditorium. Refresher training sessions for those who have previously volunteered for Inspection days will be held from 9 a.m. to 10 a.m. Oct. 6 and 7 in the Teague Auditorium.

How do I obtain an exhibitor's badge?

If you have not yet received your badge, contact your directorate/office point-of-contact or the Inspection office.

Will employee parking be affected during Inspection 98?

Employee parking will not be affected during the event except for those who park near Bldgs. 9, 31 and 37. The parking lot for displaced employees who work in these buildings is the large parking lot between Bldg. 44 and Second Street. Mini-buses will run continuously from 6:30 a.m. to 7 p.m. to take employees to and from their buildings.

How do I obtain more information about Inspection 98?

Visit the Inspection 98 web page at <http://inspection.jsc.nasa.gov>, or check out the internal web page at <http://www4.jsc.nasa.gov/inspection/>, or call the Inspection 98 office at x41316. ■

Aerospace technologies finding down-to-earth applications

Connections made during past Inspection days have led to successful partnerships and to the use of NASA-developed technologies across many non-aerospace industries. Technology developed for space exploration has found application throughout society – from energy, transportation and agriculture to medicine, communications and electronics. Inspection 98 seeks to accelerate these adaptations of space technology.

Success stories describing how attendees have benefited from prior JSC Inspection days include:

Biotechnology

Connections made at Inspection 96 have helped Montana Biotech, a small lab near Yellowstone National Park, begin working with NASA on related technical research. Visitors discovered that their research on extremophiles, bacteria that live in extreme environments, is applicable to NASA's work on handling planetary samples. In preparation for handling Mars samples, NASA and Montana Biotech recently signed a Space Act Agreement under which NASA is studying how to sterilize rock samples containing bacteria, and Montana Biotech is examining these samples to see if they have been successfully sterilized.

Mining

America's coal mining industry could get a high-tech boost from the space program in its efforts to improve efficiency and increase competitiveness.

When members of the National Robotics Engineering Consortium visited Inspection 97, they found help for Joy Mining Co. in developing continuous mining equipment. The NREC is a cooperative venture among NASA, the City of Pittsburgh, the State of Pennsylvania and Carnegie Mellon University established in 1995 to develop products that use advanced mobile robotics technology.

Joy Mining is the largest U.S. producer of continuous equipment used to mine materials such as coal and potash. The NREC is developing add-on automation modules for continuous miners using technologies from JSC. Such equipment could enable the industry to mine shrinking U.S. coal reserves by tapping smaller coal streams that are inaccessible to humans. The NREC describes the potential for automated mining equipment as "enormous."

Energy

Space shuttle technology is at work on the ocean floor in deepwater drilling applications partly as a result of Inspection 97. The event provided an idea for a reliable and less costly solution to a problem that has long plagued the offshore petroleum industry.

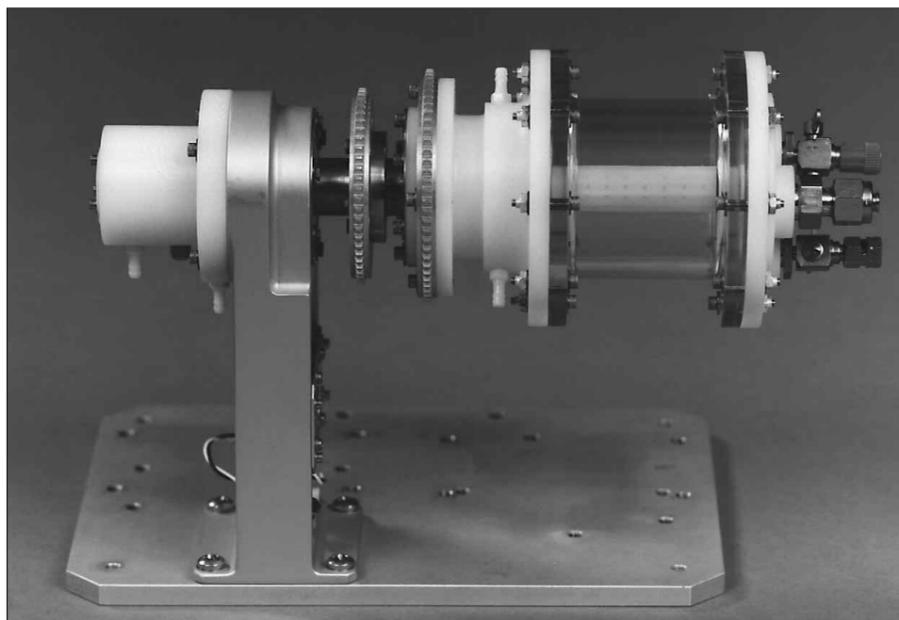
Using shuttle docking technology, Bernt Helleso, owner of Houston-based Unitech International, developed a Multi Quick Connector that joins electrical and hydraulic lines to subsea wellheads thousands of feet below the ocean's surface. Where the lines were previously plugged into the wellheads and the connections were opened simultaneously, the new device allows for a two-phase operation, one that first docks and then, with the device securely aligned, engages the connections. Single-step operations often resulted in severe damage, but the new technique has improved reliability in making connections in high-pressure environments.

Medicine

The NASA-developed bioreactor, a rotating cell culture device that allows cells to differentiate into specialized forms, has made many appearances at past Inspection

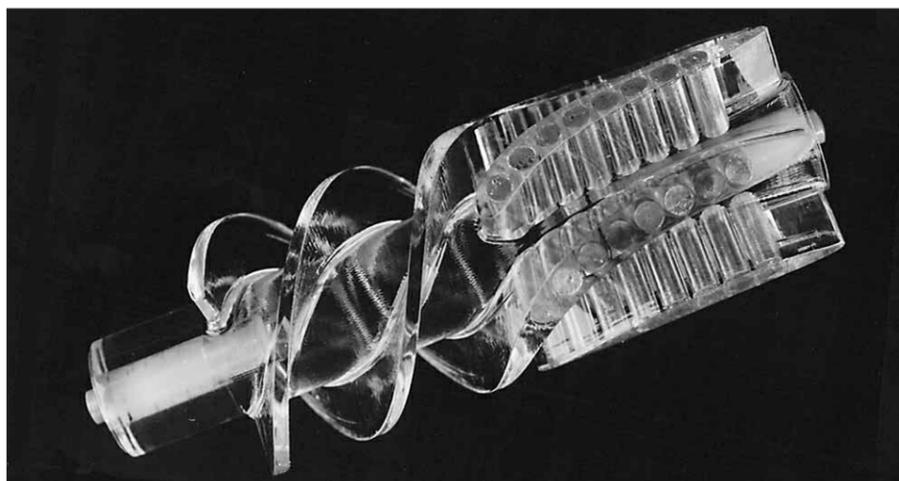


NASA Photo STS070-301-025



The bioreactor was developed to keep tissue cultures suspended during the ascent, orbit and entry phases of flight by maintaining them in a state of continual motion, thus preventing tissue damage. These 3-D tissues are crucial to understanding and finding treatments for many diseases including cancer and AIDS.

The NREC is developing add-on automation modules for continuous miners using technologies from JSC. Such equipment could enable the industry to mine shrinking U.S. coal reserves by tapping smaller coal streams that are inaccessible to humans.



JSC Photo S95-05687

Shown is a side view of the inducer-impeller, a component of a heart pump. This small turbine pump works with the heart's own pumping ability either as a temporary device or as a permanent one. A team of JSC employees and Baylor College of Medicine specialists developed the pump.

On board STS-70 Astronaut Mary Ellen Weber works with a syringe related to the bioreactor system. The almost weightless state of space travel provides life science researchers with the opportunity to grow cells into three-dimensional tissue pieces that are not achievable using conventional tissue culture methods on Earth. At specified times during the STS-70 mission, crew members injected color producing substances to document fluid movement in the reactor, and various-sized beads to estimate the tissue size that could be supported in the bioreactor.

events. The device allows human cells to be grown in such a way that they take on characteristics of those in normal tissues. The breakthrough device could hasten the day when replacement tissues or even whole organs for transplantation could be grown in a culture.

Researchers across the country have found many uses for the bioreactor. One medical researcher is using it to grow gliomas, deadly brain cancers, so that patients' lymphocytes can be "trained" outside the body to attack the tumor before the cells are implanted in the brain. Another microbiologist is using the apparatus to grow lung and liver cells that produce enzymes and other molecular markers normally seen only in intact tissue. And another researcher is growing colon-lining cells and has preliminary evidence that the bioreactor will support the growth of Norwalk virus, an important agent of disease that will not propagate in standard cultures needed for study.

Researchers across the country look forward to the time when bioreactors aboard the International Space Station will be used to grow replacement human organs for transplantation. Experimental results derived from long-term research into the physiology of human beings could produce a windfall to medicine. ■

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 6 3

The first of the spacecraft for Project Gemini was delivered recently by McDonnell Aircraft Corporation to NASA Manned Spacecraft Center officials at Cape Canaveral, Fla., for preflight checkout procedures leading to the first Gemini mission.

Spacecraft No. 1 will be used in an unmanned orbital flight from the Cape, tentatively scheduled for early next year.

1 9 6 8

The precount for the Apollo VII mission at Roundup press-time was clicking along smoothly toward a launch at 10 a.m. CDT today. Mechanical buildup of the Apollo VII spacecraft Wednesday was completed as pyrotechnic devices and other ordnance were installed.

1 9 7 3

Clinical research in female physiology to develop selection criteria for woman passengers on space shuttle missions has begun at NASA's Ames Research Center, Mountain View, Calif., as a follow-on to similar studies on men conducted last year.

Twelve nurses are joining a five-week experiment as volunteers to find out how weightlessness and reentry Gs may affect the female body. After two weeks of orientation and preliminary medical studies, eight of the 12 nurses will simulate weightlessness by absolute bedrest and four will act as ambulatory control subjects.

1 9 8 8

The Orbiter *Atlantis* is undergoing final preparations at Kennedy Space Center for her third trip to space, currently scheduled to be launched in less than a month.

The same modifications made to *Discovery* have been completed on *Atlantis*, a veteran of shuttle missions 51-J in October 1985 and 61-B in November 1985, and the Orbiter is getting final touches in Bay 2 of Kennedy's Orbiter Processing Facility.

New batting cages installed at Gilruth Center

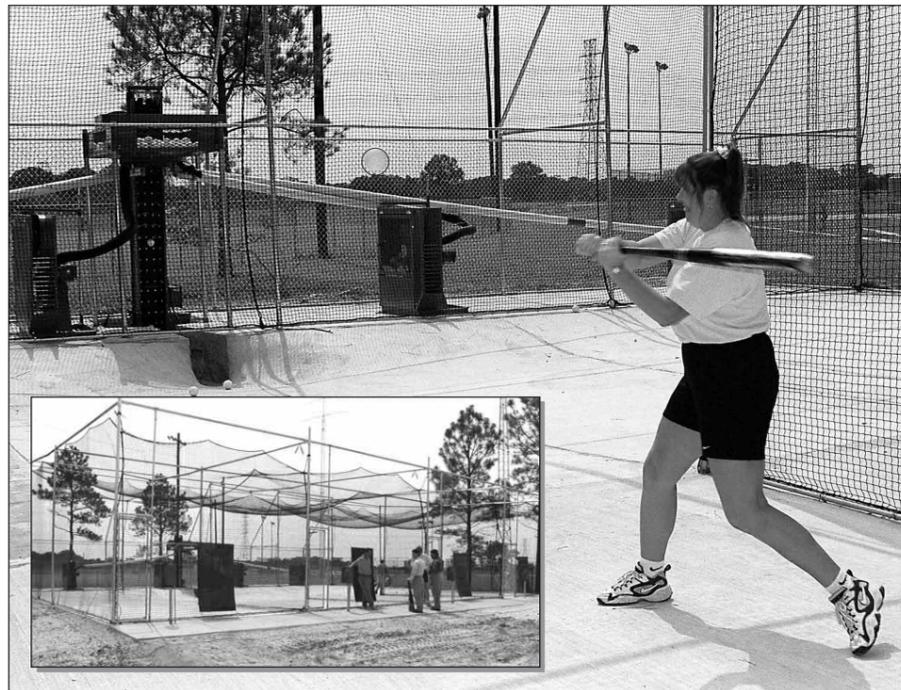
An intercenter team of employees from the JSC Exchange, Center Operations Directorate, Procurement and the EAA, working with G&Z contracting, has completed construction of four batting cages.

These cages, located at the entrance to softball fields one, two and three at the Gilruth, opened in early September. Each cage is coin-operated, providing batters with the opportunity to swing at 20 pitches for \$1. The batting cages can be set for a specific time limit, thus enabling teams to pay a set amount and take batting practice together.

"We're excited about the new batting cages, and we've received a tremendous response from our softball players," commented Karl Schuler, the JSC Exchange's operations manager. "I'd like to thank the Exchange's equitable share partners who made this project possible."

The cages will have plenty of use since softball is the most popular of all the sports played at the Gilruth. Four leagues comprised of 68 teams are scheduled to play this fall.

"The cages were needed to give participants a chance to practice batting,"



JSC Photos S98-12361, S98-12362 (insert) by Steve Candler

Robin Hartlieb, Gilruth Center assistant recreation director, practices her hitting in one of the new batting cages.

said Eddy Rodriguez, Gilruth recreation director. "The players now have a top-notch facility to use year-round."

The batting cages are the most recent addition of many improvements that have either been completed or are under way at the Gilruth. Two lighted, regulation-sized sand volleyball courts opened last May and two new playgrounds have been built. Future projects include upgrading

the soccer/football field and remodeling the Gilruth's ballroom.

"We plan to invest in upgrading our Gilruth Center during the upcoming fiscal year," added Schuler. "Over the past two years, we have remodeled the Bldg. 3 cafeteria and built the new retail store. Improving the facilities at the Gilruth Center will be one of our primary focuses in FY99." ■

JSC space station employee Rusczyk dies at work

The NASA family is mourning the loss of David Rusczyk of the International Space Station (ISS) Program Office from a ruptured aorta. He collapsed near his office at the Sonny Carter Training Facility on Sept. 11.

Rusczyk was 35 years old and worked as the ISS program lead for guidance, navigation and control system integration.

After graduating in 1985 with a B.S. in aerospace engineering from the State University of New York at Buffalo, Rusczyk spent almost 13 years working on various NASA programs and projects. During that period he designed many shuttle missions, controlled Tracking and Data Relay Satellite System spacecraft



Rusczyk

trajectories, helped integrate the Space Station Freedom GN&C system, led development of the ISS Environmental Impact Statement, helped integrate the ISS communications and tracking system and led integration of the ISS GN&C system. He received numerous awards for his efforts.

Bill Panter, manager, ISS Avionics Integration Office, said, "David was the

type of person a supervisor wishes everyone on the team could be. His technical and interpersonal skills were superb. He was willing to accept any assignment, no matter how difficult, and always got the job done successfully. In fact, he often didn't get as much credit as he deserved because he handled his responsibilities so well that they didn't need to receive upper management attention."

Rusczyk grew up in Buffalo. His hobbies included HO scale model trains, woodworking and many home improvement projects.

Rusczyk is survived by his wife, Dawn, and their three children: Craig, 10; Danielle, 9; and Bryan, 7. ■

JSC to kick off Combined Federal Campaign

Center's goal for 'Make this a Campaign For Caring' is \$500,000

JSC officially will kick off the 28th annual Combined Federal Campaign on Oct. 23, establishing a goal of \$500,000 for 1998.

The theme for the Texas Gulf Coast CFC, of which JSC's efforts are a part, is "Make This a Campaign for Caring." The JSC campaign will run through Dec. 4.

The CFC is an annual voluntary fund-raising effort that gives JSC employees a chance to contribute to local, national and international health and welfare charities. The CFC was established by Presidential executive order to provide a single, uniform fundraising program within the federal government. The Office of Personnel Management establishes the

regulations governing the CFC including the charities which participate in the campaign.

There are more than 1,500 charitable organizations in the Houston CFC. These agencies are listed in a brochure that will be available online and copies will be available from each organization's coordinator.

Last year, JSC employees gave more than \$505,000 of the \$2.5 million contributed by federal employees throughout the Houston area. This year's CFC goal is \$2.6 million.

JSC CFC Coordinator Teresa Sullivan said there are some interesting incentives this year for employees who pledge one hour's pay or more. Those who pledge one hour's pay per month will receive a

CFC lapel pin. Those who pledge two hours' pay will receive a lapel pin and a badge lanyard. Those who pledge \$600 or more per year will receive a lapel pin, a badge lanyard and a personalized certificate of appreciation signed by the STS-95 crew.

In addition, those employees contributing one hour's pay per month or more will be eligible for the drawing for five three-month reserved parking spaces. The drawing will be held at the conclusion of the campaign.

For further information, contact your organization's coordinator or Sullivan at x31034. ■



P E R S O N A L I T Y P R O F I L E

**Ginger Gibson:
The ultimate
organizer**

By John Ira Petty

When it was over, the voice on the two-way radios used by JSC Open House organizers was a raspy echo of hoarseness. But the voice's owner, Virginia "Ginger" Gibson, did not seem to mind.

Gibson is a management assistant in the Center Operations Directorate, although she functions as the directorate's special events coordinator. "That means I do whatever they want me to do," she said. Her duties include organizing site logistics for Open House, the Ballunar Liffoff Festival, Safety Day, Inspection 98 and many other events.

At Open House, she carried a pager, two radios and two cell phones (which accounted for the hoarseness) with her on her travels around the site in the electric-powered grounds truck, complete with a sign identifying it as "Ginger's Buggy." Her duties included all sorts of logistics – dealing with tents, tables, chairs, water, security, power, grounds maintenance, custodial preparations and, during the event itself, visitors looking for particular attractions or lost children.

Of Open House she said, "I don't think we could do anything more positive. It's a lot of effort, but by the end of the day you have to be kind of excited about working here because the public's enthusiasm rubs off on you."

Other events – from Houston Livestock



JSC Photo S98-13392 by Steve Candler

Ginger Gibson and Jerry McCullough of Brown & Root review logistics issues prior to Inspection 98.

Show & Rodeo activities and the leadership conference to American Heritage Day fill the calendar. She also is responsible for center holiday decorations.

Gibson is a native of Nashville, Tenn. After finishing high school there she became a telephone operator. Later she moved to Huntsville, Ala., where she married husband Gene, a design engineer working at Marshall Space Flight Center. There she worked in sales and marketing.

As the Apollo program wound down, they moved to Pascagoula, Miss., and then, in 1973, to Houston. Gibson came to work

at JSC in May of that year as a telephone operator. She was a temporary employee and planned to work for just a few months at the center. But when a permanent position became available, she was on the civil service register and got the job. She has been here ever since.

Gibson has been in COD the whole time, which is one reason she knows it so well. Being a switchboard operator for years gave her a good overview of the entire center. She subsequently went to work in COD's Construction Branch in the Plant Engineering Division as the branch

secretary and has been in the directorate office since 1990.

Gibson was on the Federal Women's Program Committee during her operator days. "I got involved in doing programs and setting up different things, so I've kind of been known as the center social director, even when I had other jobs," she said. She has been a big part of the Employee Activities Association since the 1980s and has served as its president for years.

Beginning in the mid-80s, her directorate held a chili cookoff, which became a major event. As many as 3,000 attended the affair held at the Gilruth Center. A small city would spring up on the Gilruth grounds as participants tried to outdo one another. The COD chili cookoff thrived for seven years.

Gibson still does a lot of charity work but not as much as she once did. She has belonged to the PBX/Telecommunicators of Houston since her time working on the JSC switchboard, serving as its international president last year.

Through her association with the organization she became involved in muscular dystrophy charity work and served on the executive board of the Houston Gulf Coast Chapter Muscular Dystrophy Association. She has served for many years as the PBX/Telecommunicators of Houston MDA coordinator.

She coordinated and supervised about 250 telephones, supervisors and the camera phone for the Houston muscular dystrophy telethon's communications for 18 years, from the year Ron Stone began as emcee of the event to the year after he left. She is still active with the MDA and supports many of its events throughout the year. ■

New Language Education Center bows in

By John Ira Petty

The new, ultramodern JSC Language Education Center made its formal debut recently with a well attended midday open house.

The language center was established to teach JSC employees the languages of International Space Station partners. The Human Resources Office and the Space Flight Training Division run the center.

Russian is the primary language taught. A few Japanese courses also are available. The language center also offers English for foreign space station crew members, liaisons and flight surgeons.

Self-study audiotapes and texts in other languages including Portuguese, Italian and French will be available soon. More languages will be added based on need.

The language center boasts 10 student audio work stations that allow the students to work, independently or in groups, on listening, speaking and comprehension skills. It also has 10 student computer stations with interactive learning software, four multi-standard television carrels with VCRs (as well as VCRs in each of the classrooms) and a library of books and reference materials. The language center has 10 classrooms, a student study center and office space for the instructors.

Debbie Denton-Misfeldt of the Human Resources Development Branch is in charge of centerwide language training. She said that about 100 non-astronaut students are enrolled in classes at any one time. Susan Anderson of the Space Flight Training Division is responsible for the astronaut classes. She said about 20 are enrolled.

Tech Trans International Inc., which also does JSC's Russian translation and interpretation, is responsible for teaching Russian and English at the language center and for developing the curriculum.

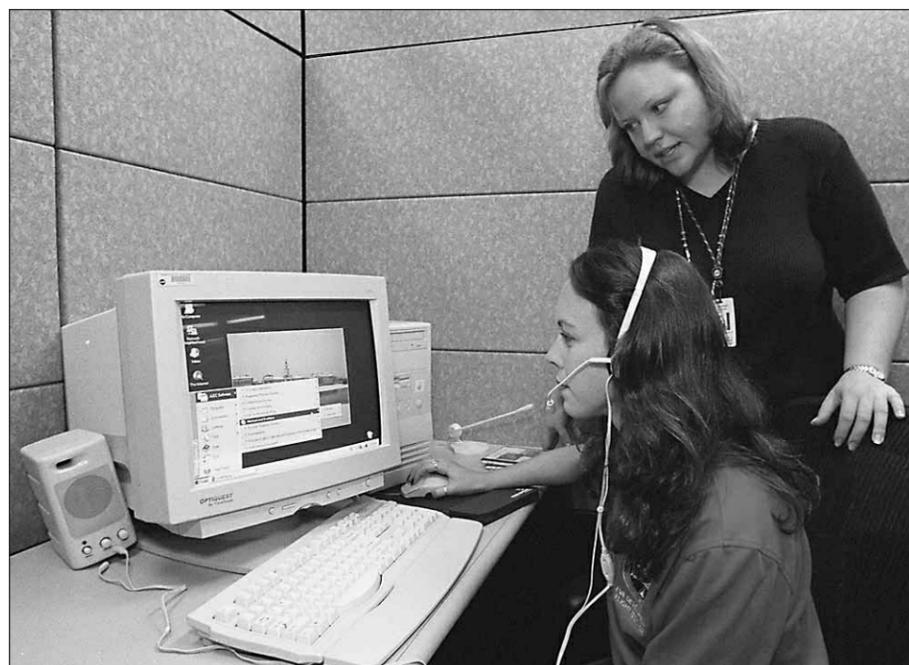
Betty Lou Leaver is Tech Trans' language program director. She and Assistant Director Paula Bilstein supervise eight full-time Russian and English language instructors. One instructor is from the Defense Language Institute in Monterey, Calif. Another instructor is under contract to teach Japanese three days a week.

All badged employees, civil servants or contractors may use the language center's multimedia equipment and check out materials from its library. Language and culture courses are open to civil servants. Contractors may enroll on a space-available basis.

For managers and astronauts who cannot attend classes regularly, the language center will develop individual study plans, which will include time to meet with the instructor for consultation.

The language center's hours are 8 a.m. to 5 p.m. Monday, Wednesday and Friday and 7 a.m. to 6 p.m. Tuesday and Thursday.

Anderson, responsible for astronaut classes, can be reached at x47718. Denton-Misfeldt, responsible for language training for non-astronauts, can be reached at x33077. ■



JSC Photo S98-11753 by Mark Sowa

Language instructor Aimee Roebuck guides engineer Heather Paul through the language software on the multimedia workstations at the Language Education Center.

**JSC Clinic
to offer blood
pressure and
cholesterol
checkup**

On October 29 and 30, the JSC Clinic again will offer cholesterol profiles and blood pressure checks. NASA civil servants and contractor employees on site who have not had these tests in the past year are invited to participate in this Total Health Program.

High blood cholesterol and high blood pressure are two of the three main controllable risk factors for coronary heart disease. Elevated cholesterol and high blood pressure are known as the "silent killers." They usually have no symptoms but can place you at a higher risk for strokes, heart attacks, heart failure and other cardiovascular diseases.

What are your risk factors? Find out by calling x34111 to make an appointment. Appointments are limited. ■



PEOPLE *on the* MOVE

Human Resources reports the following personnel changes as of September 5, 1998:

Key Management Assignments

Glen Lutz was selected as chief, Crew and Thermal Systems Division, Engineering Directorate.

Mike Golightly was selected as chief, Space Science Branch, Earth Science and Solar System Exploration Division, Space and Life Sciences Directorate.

Al Manson was selected as chief, Aircraft Maintenance and Engineering Branch, Aircraft Operations Division, Flight Crew Operations Directorate.

Additions to the Workforce

Carl Agee joins the Office of the Director as chief scientist for astromaterials.

J.R. Carpentier joins the Institutional Business Management Office in the Business Management Directorate as a contract specialist.

Glen Swanson joins the Information Systems Directorate as a historian.

Clay Anderson, Tracy Caldwell, Greg Chamitoff, Mike Fossum, Patricia Hilliard, Greg Johnson, Stan Love, Leland Melvin, Barbara Morgan, John Olivas, Nicholas Patrick, Garrett Reisman and Steve Swanson join the Astronaut Operations Office in the Flight Crew Operations Directorate as civilian astronaut candidates.

Mark Gibb joins the Orbit Dynamics Branch in the Mission Operations Directorate as a flight controller.

Rich Mrozinski joins the Ascent/Descent Dynamics Branch in the Mission Operations Directorate as a descent analyst and flight controller.

Liz Blok and Margaret Gibb join the Cargo Integration and Operations Branch in the Mission Operations Directorate as flight controllers.

Macresia Alibaraho, Chris Farrar, Ana Lopez, Mike Morris and Brian O'Hagan join the Communications and Data Systems Branch in the Mission Operations Directorate as flight controllers.

Melvin Friant, Jerry Jason, Ted Kenny and Terence Williams join the Mechanical, Booster and Maintenance Crew Systems Branch in the Mission Operations Directorate as flight controllers.

Robert Estep joins the Environmental Systems Branch in the Mission Operations Directorate as a flight controller.

Kouri Miller joins the Electrical Systems Branch in the Mission Operations Directorate as a flight controller.

Mike Moses joins the Guidance and Propulsion Systems Branch in the Mission Operations Directorate as a flight controller.

Steve Riley joins the EVA and Robotics Systems Branch in the Mission Operations Directorate as a flight controller.

Reassignments Between Directorates

Cheryl Bass moves from the Space Shuttle Program Office to the Business Management Directorate.

Honey Hyman moves from the Flight Crew Operations Directorate to the Space Shuttle Program Office.

Tom McPherson moves from the Phase I Program Office to the Space Shuttle Program Office.

John Fields moves from the Mission Operations Directorate to the Safety, Reliability and Quality Assurance Office.

Travis Brice moves from the Phase I Program Office to the International Space Station Program Office.

Reassignments Between Centers

David Culp of the Business Management Directorate moves to Kennedy Space Center.

Mariann Albjerg of the Space Shuttle Program Office moves to Goddard Space Flight Center.

Scott Hutchins of the Space Shuttle Program Office moves to Marshall Space Flight Center.

Dennis Dillman of the Space Shuttle Program Office moves to Goddard Space Flight Center.

Mike Kearney of the International Space Station Program Office moves to Marshall Space Flight Center.

Mark Buntin of the Space and Life Sciences Directorate moves to Langley Research Center.

Robert Suggs of the Space and Life Sciences Directorate moves to Marshall Space Flight Center.

DATES & DATA

October 7

Astronomy seminar: The JSC Astronomy Seminar will meet at noon Oct. 7, 14, 21 and 28 in Bldg. 31, Rm. 129. For additional information, call Al Jackson at x35037.

Spaceland Toastmasters meet: The Spaceland Toastmasters will meet at 7 a.m. Oct. 7, 14, 21 and 28 at the House of Prayer Lutheran Church. For more information, call George Salazar at x30162.

Communicators meet: The Clear Lake Communicators, a Toastmasters club, will meet at 11:30 a.m. Oct. 7, 14, 21 and 28 at Lockheed Martin, 555 Fordge River Rd. For more information, call Allen Prescott at 282-3281 or Mark Caronna at 282-4306.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters will meet at 11:30 a.m. Oct. 7, 14, 21 and 28 at United Space Alliance, 600 Gemini. For details, call Patricia Blackwell at (281) 282-4302 or Brian Collins at x35190.

October 8

MAES meets: The Society of Mexican-American Engineers and Scientists will meet at 11:30 a.m. Oct. 8 in Bldg. 16, Rm. 111. For details, call George Salazar at x30162.

Airplane club meets: The MSC Radio Control Airplane Club meets at 7 p.m. Oct. 8 at the Clear Lake Park pavilion. For more information, call Bill Langdoc at x35970.

SSQ meets: The Society for Software Quality will meet at 5:30 p.m. Oct. 8 at the Holiday Inn. For more information, call Earl Lee at 335-2322 or Herb Babineaux at x34263.

October 9

Astronomers meet: The JSC Astronomical Society will meet at 7:30 p.m. Oct. 9 at the Center for Advanced Space Studies, 3600 Bay Area Blvd. For more information, call Chuck Shaw at x35416.

October 13

Aero club meets: The Bay Area Aero Club will meet at 7 p.m. Oct. 13 at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For more information, call Larry Hendrickson at x32050.

NPMA meets: The National Property Management Association will meet at 5 p.m. Oct. 13 at 216 Kirby in Seabrook. Dinner costs \$14. For details, call Sina Hawsey at x36582.

October 14

JSC Inspection 98: JSC invites industry, business, community and education leaders to inspect the center's technologies and facilities, Oct. 14-16. Visit the Inspection 98 web page at <http://inspection.jsc.nasa.gov>, or check out the internal web page at <http://www4.jsc.nasa.gov/inspection/>, or call the Inspection 98 office at x41316.

PSI meets: The Clear Lake/NASA Chapter of Professional Secretaries International will meet at 5:30 p.m. Oct. 14 at Bay Oaks Country Club. Cost is \$16. For details, call Elaine Kemp at x30556.

October 15

Directors meet: The Space Family Education board of directors will meet at 11:30 a.m. Oct. 15 in Bldg. 45, Rm. 712D. For more information on this open meeting, call Gretchen Thomas at x37664.

October 21

Scuba club meets: The Lunarfans will meet at 7:30 p.m. Oct. 21 at Pot Pie Pizzeria at Watergate Marina. For additional information, call Mike Manering at x32618.

JSC NMA and NCMA joint meeting: Deidre Lee, Director of the Office of Federal Procurement Policy under OMB, will speak. For details, call Debbie Conder at x38325.

October 29

Radio Club meets: The JSC Amateur Radio Club will meet at 6:30 p.m. Oct. 29 at the Piccadilly, 2465 Bay Area Blvd. For additional information, call Larry Dietrich at x39198.

November 10

JSC NMA meets: Dr. John Stobo, head of the Univ. of Texas Medical Branch in Galveston, will speak. For details call Debbie Conder at x38325.

November 13

Skylab reunion: Civil servants and contractor employees who worked on the Skylab program will hold a reunion at 8 p.m. Nov. 13 at Space Center Houston. For details call x41998.

NASA BRIEFS

STEPHENSON NAMED TO HEAD MARSHALL SPACE FLIGHT CENTER

Arthur G. Stephenson, president of Oceanering Advanced Technologies, Houston, was named director of NASA's Marshall Space Flight Center. He has more than 30 years of experience as a manager in spacecraft and high technology systems.

"Arthur Stephenson is a bright, aggressive person who will fight for issues critical to NASA and who will make sure this agency has the best launch and in-space propulsion capabilities and technical tools in the world," said NASA Administrator Daniel S. Goldin.

SCIENTISTS OBSERVE TALL CHIMNEY CLOUD IN HURRICANE

NASA researchers have obtained compelling images from Hurricane Bonnie showing a storm cloud towering like a mountain, 59,000 feet into the sky from the eye wall. These images were obtained on Aug. 22 by the world's first spaceborne rain radar aboard the Tropical Rainfall Measuring Mission, a joint U.S.-Japanese mission. Many scientists believe that towering cloud structures, such as the one observed by TRMM, are probably a precursor to hurricane intensification.

This was the situation with Hurricane Bonnie, whose central pressure dropped from 977 millibars to 957 millibars in the subsequent 24 hours. Lower air pressure is associated with higher wind speeds and overall storm strengthening. TRMM was launched Nov. 27, 1997, from the Japanese Space Center, Tanegashima, Japan, and is a joint United States and Japanese mission, the first dedicated to measuring tropical and subtropical rainfall through microwave and visible infrared sensors, including the first spaceborne rain radar.

More information about the TRMM project is available at: <http://trmm.gsfc.nasa.gov>.

JPL, FORD AGREEMENT PAVES WAY TO CLEANER AIR

A new computer chip that mimics how the human mind works is making its way from the space program to American industry.

NASA's Jet Propulsion Laboratory and the Ford Motor Co. have signed a licensing agreement for use of an advanced neural network technology to diagnose misfiring under the hoods of Ford automobiles, among its many potential applications. With the advent of this new chip, vehicles should show a reduction in emission levels.

JPL and Ford scientists say the chip represents the first significant change in the way computing is done on vehicles since computers were first introduced into automobiles in the 1970s.



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